4 Restoration

"At least as important as the ecosystems the restorationist gives back to nature is the deepening of understanding, awareness, and caring that is the direct result of this work, when it is carried out thoughtfully and attentively."

—William R. Jordan, III

Though preservation of park resources is a central part of the National Park Service mission, restoration of those resources, in particular ecological restoration of degraded natural resources, is an important strategy that provides for the well-being and enjoyment of the national parks. As park units have been added to the National Park System, the Park Service has inherited many degraded resources: altered habitats, eroded soils, extirpated native species, changed landforms, and impeded ecological processes. In many cases, restoration can reverse environmental damage and lead to the recovery of deteriorated sites. And though it is not a substitute for preservation, restoration is more than just a technical prescription for landscape healing. Done thoughtfully and thoroughly, it involves specialists acting as landscape historians, turning up information from a site's past that is critical to the quality of its future. An expression of human creativity and respect, restoration offers hope for damaged park natural landscapes and gives them meanings they never had before. Surely limitations of scale and cost are real, but as the following articles indicate, restoration is a significant conservation strategy for the future of the national parks.

Restoration of the American chestnut

By James L. Sherald, Ph.D.

IN THE EARLY 20TH CENTURY the American chestnut (*Castanea dentate* [Marsh.] Borkh.) extended from Maine to Mississippi and eastern Michigan, comprising 25% of the forest and covering more than 200 million acres (81 million ha). Throughout the natural range where the American chestnut was dominant, the National Park Service now manages more than 80 units, including parks where the chestnut was a prominent feature, such as Great Smoky Mountains and Shenandoah National Parks and Blue Ridge Parkway. Trees 100 feet (31 m) tall and more than 7 feet (2 m) in diameter were not uncommon. The tree's easily worked and resilient wood, as well as its abundant and nutritious nuts, played a significant role in the cultural and ecological heritage of the Appalachian Mountains. In just 50 years, however, this magnificent species was reduced to a few scattered survivors and sprouts arising from stumps of dead and declining trees. Its demise was an introduced fungal pathogen (*Cryphonectria parasitica* [Murr.] Barr), which was first noticed in 1904 at the New York Zoological Park.

In just 50 years … this magnificent species was reduced to a few scattered survivors and sprouts arising from stumps of dead and declining trees.

A growing interest in the long-range implications for American chestnut restoration prompted the National Park Service to host the conference "Restoration of Chestnut to Forest Lands within the National Park System," held 4–6 May 2004 at the North Carolina Arboretum in Asheville. Twenty-four speakers addressed the ecological history of the American chestnut, the impact of its loss, developments in chestnut blight resistance, genetic issues, practical considerations associated with restoration, and NPS restoration policies, objectives, and opportunities. The conference was funded by the NPS Natural Resource Stewardship and Science directorate through the Chesapeake Watershed and Southern Appalachian Mountains Cooperative Ecosystem Studies Units and organized by the Pennsylvania State University. More than 80 individuals, representing national parks, national and state forests, and academic and nonprofit institutions, participated.

Throughout the history of chestnut blight, considerable research has been devoted to understanding the disease and its control, primarily through breeding programs. In recent years, several areas of research have shown promise: crossing American chestnut with the resistant Chinese chestnut (*Castanea mollissima* Blume), selecting and breeding putative resistant American chestnuts, genetic engineering of the American chestnut to enhance resistance, and developing hypovirulent (less harmful) pathogen strains as biological controls.

The most promising advance presented is the development of blight-resistant hybrid chestnuts. The American Chestnut Foundation has incorporated disease-resistant genes from the Chinese chestnut through successive backcrossing to the American chestnut. (Backcrossing

The National Park Service manages 80 park areas where the American chestnut was once dominant. Devastated by a nonnative fungus, most mature trees vanished by the early 1940s. Promising research in the development of disease-resistant hybrids has helped arouse interest in eventual restoration of the species. This American chestnut in West Salem, Wisconsin, has survived the blight.

The American chestnut once occupied 30% to 40% of some forested areas of Great Smoky Mountains National Park, according to the park's first naturalist, Arthur Stupka. Specimens regularly measured 4 feet (1.2 m) in diameter, with some as large as 10 feet (3.1 m) in diameter.

In 2003, staff at Great Smoky Mountains National Park recorded nearly 300 living chestnuts, of which more than 50% had flowers and 10% had fruit. Sprouting from roots unaffected by the fungus, young chestnuts from the park provide pure American chestnut pollen, nuts, and tips of branches from which researchers hope to develop disease-resistant hybrids.

is crossing a hybrid with one of its parents.) Resistant hybrids will be indistinguishable from the American chestnut after three successive backcrosses. The process is laborious and will take many years before sufficient progeny are available for restoration plantings. The overall performance of the hybrids under varying field conditions is still undetermined, and resistance could break down when confronted by more virulent strains of the pathogen.

Although the National Park Service's ability to engage in chestnut restoration is still in the distant future, resource managers in parks with American chestnut legacies should consider the extent to which

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restoration could and should be pursued. There are appropriate near-term measures that NPS managers can take to contribute to the restoration of the chestnut. First, they can catalog existing trees and sprouts and document chestnut habitats. They can also maintain pure American chestnuts by opening tree canopies over sprouts to allow for long-term replenishment of sprouts and the development of pollen that can be used by researchers. Another practical approach in the near term may be establishing interpretive demonstration plantings of backcross hybrids or, when available, transgenic plants (i.e., plants that have had foreign DNA stably integrated into their genome). National Park Service policy permits the use of hybrids or genetically engineered plants, providing they closely approximate the species lost. Demonstration plantings would provide opportunities to develop restoration techniques and evaluate hybrids while giving the public the opportunity to experience chestnuts and appreciate the role of science in population and landscape restoration. An information paper discussing the implications of new technologies and their practical applications to American chestnut restoration is being developed by the NPS conference organizers. The conference proceedings will be available in 2005. ■

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Elwha River system to be restored in Olympic National Park

By Brian Winter

Two dams on the Elwha River that eliminated salmon and steelhead runs in Olympic National Park, Washington, will be dismantled beginning in 2008. The Elwha and Glines Canyon Dams have also caused the inundation and degradation of important riverine and terrestrial habitat in and near the park and have degraded water quality (increased temperatures and reduced nutrients) downstream. A series of important milestones over the past 15 years led to the 6 August 2004 signing of a multiagency memorandum of understanding that charts the area's eventual restoration.

In 1992, Congress enacted the Elwha River Ecosystem and Fisheries Restoration Act. This act directs the Secretary of the Interior to fully restore the Elwha River ecosystem and native anadromous fisheries, which is determined to be feasible only through the removal of both dams. As stated in the act, the federal government purchased the dams in 2000 for $29.5 million. The Bureau of Reclamation coordinates the operation of the dams with the National Park Service while the Bonneville Power Administration markets the power and funds the operation and maintenance of the hydropower generation.

Summer 2004's memorandum of understanding identifies the National Park Service, the City of Port Angeles, and the Lower Elwha Klallam Tribe as responsible parties in executing agreed-upon industrial, fish hatchery, and municipal water quality mitigation measures. Two other project partners, the Washington Department of Fish and Wildlife and Nippon Paper Industries, have agreed in principle to their roles in the restoration project as negotiations with the Dry Creek Water Association continue.

Construction of facilities to protect the domestic water supply for area homeowners was completed in 2003. Construction of the remaining mitigation facilities will begin in 2005 and 2006, followed by removal of the dams beginning in 2008. Their removal will ultimately allow for the restoration of an estimated 392,000 salmon and steelhead in and near the national park. ■

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Glines Canyon Dam in Olympic National Park as it looks today (top) and a simulation of the site following restoration (bottom). The spillway will be retained so that the National Park Service can interpret the reasons for the dam's construction and removal, and to preserve a part of the dam, which is on the National Register of Historic Places.

Wetland and historic landscape restoration at Manassas National Battlefield Park

By Bryan Gorsira

MANASSAS NATIONAL BATTLEFIELD PARK, VIRGINIA, was established in 1940 to preserve and interpret the sites of the First and Second Battles of Manassas. The first, fought on 21 July 1861, was also the first major land battle of the Civil War. Thirteen months later, Union and Confederate forces returned to the same ground and fought an intense battle over three days, during which about 33,000 soldiers died. The National Park Service manages these landscapes by protecting the large tracts of land that represent the scene as it existed at the time of the battles 143 years ago. The open fields, wooded areas, ridges, valleys, and streams helped define the fields of battle.

In 1988, Manassas National Battlefield Park acquired 558 acres (226 ha) as part of a legislative taking of the Stuart's Hill tract, which is now located in the southwestern portion of the park and incorporates a portion of the Second Battle of Manassas. This tract contained a 100-acre (40-ha) area that was heavily disturbed prior to the purchase (aerial photo, this page); a developer had drastically altered the landscape for a combined residential and commercial development. Alterations included recontouring the area, constructing an entrance road, and reconfiguring the drainage network in preparation for construction of a subdivision and a mall. In addition to these changes, the development company altered the natural hydrology, including filling in wetland areas.

In 1997 the Smithsonian Institution approached managers at Manassas National Battlefield Park to determine whether an appropriate location existed within the park for a wetland replacement project. The Smithsonian Institution was developing plans for its new Air and Space Museum on a wetland tract at Dulles Airport, but could not build without a wetland mitigation plan, which required replacement of wetland loss somewhere off the airport's property. A potential mitigation project at the battlefield would not only meet the Smithsonian's needs but would also achieve the park's requirement to preserve historical landscape features and the integrity of the battlefield site.

Fortuitously, several years earlier the National Park Service had contracted with the School of Design at the University of Georgia to study the newly acquired Stuart's Hill site and develop a general plan for restoring the heavily disturbed area to its 1862 conditions. With this study in hand, the Smithsonian Institution and Manassas National Battlefield Park agreed that the disturbed area would be an appropriate location for this mitigation project.

After years of planning and negotiations, restoration and mitigation were completed in November 2003, taking six months. This involved excavation of more than 100 acres (40 ha), grading slopes to their 1862 contours, and restoring approximately 30 acres (12 ha) of emergent wetlands and 15 acres (6 ha) of forested wetlands that had been altered by the development company. Staff planted upland areas in native warm-season grasses, creating a habitat type that is rapidly dwindling in Virginia, reduced by 55% since 1945. This project was a classic win-win situation for the Smithsonian Institution, which was able to mitigate its wetland damage in the most economical manner possible, and for the National Park Service, which was able to restore its severely compromised cultural and natural resource.

Today parks encounter many threats to their resources, requiring managers to develop a variety of strategies to solve complex conservation issues. Incremental loss of wetlands is likely to continue, with the potential to affect many parks and their resources. The case of Manassas National Battlefield Park shows that wetland banking and other collaborative partnerships with private and public entities can provide opportunities to help compensate for resource damage outside park boundaries with restoration of both natural and cultural resources within parks. ■

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An aerial view of the Stuart's Hill tract of Manassas National Battlefield Park (left, park boundaries shown in red) reveals a site disturbed by planned development (yellow area) as it appeared before restoration. The previous landowner had filled in a portion of wetland for a road crossing and altered the area's drainage, negating the site's former characteristics as a wetland. Removal of the road and restoration of the downstream channel (top) produced conditions suitable for the reestablishment of a forested wetland (bottom).

Freshwater tidal marsh recovery under way at Cape Cod

By Carrie Phillips

Suffering from poor water quality, high turbidity, and periodic fish kills, East Harbor in Cape Cod National Seashore was not always in such bad shape. A dike constructed in 1868 isolated the 717-acre (290-ha) estuary from Cape Cod Bay, robbing it of tidal waters needed for native species to flourish. Over time the now-artificial, freshwater lake became dominated by nonnative fish and plants. But in 2001, resource managers at Cape Cod National Seashore and the town of Truro, Massachusetts, had a different idea for East Harbor's future: restoration. They opened the tide-gate in the culvert connecting the lake to Cape Cod Bay, allowing marine waters to reach the lake during rising tides. This simple change has prompted an apparent ecological recovery, with noted improvements in water quality and an increase in native vegetation. It has also encouraged the return of crabs, shrimp, estuarine fish, and bottom-dwelling species such as clams, mussels, and marine worms.

In 2004, two additional developments came to light that indicate recovery is under way. First, while monitoring salt-marsh vegetation, biologists detected eelgrass (*Zostera marina*), a submerged aquatic plant that requires clear, clean water for growth. The reappearance of *Zostera* in East Harbor confirms a biotic response to the improvement of water quality, particularly increased salinity and decreased turbidity. It also signals recovery of important ecosystem functions because *Zostera* is a primary food source for brant and an important habitat for crab, shrimp, the juvenile stages of commercially important finfish, and other marine species. The second development of note is the return of hard clams (*Mercenaria mercenaria*), soft-shelled clams (*Mya arenaria*), and blue mussels *(Mytilus edulis*). These species were detected during benthic-community monitoring supported by the Atlantic Research Learning Center in collaboration with the Cape Cod Prototype Monitoring Program. These species also indicate improved sediment and water quality, and are of high cultural, recreational, and commercial importance on outer Cape Cod. ■

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Just three years after allowing tidal waters into a former estuary, resource managers at Cape Cod National Seashore documented eelgrass (left) and several species of bivalves (right) in 2004, signs of ecological recovery.

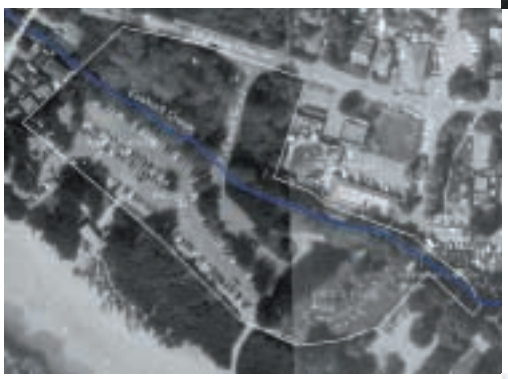
Small-stream habitat restoration projects pay big dividends

By Jim Tilmant, Randy Ferrin, and Darren Fong

AS THE NATIONAL PARK SERVICE STRIVES TO PROTECT native species and habitat in parks, the need for aquatic habitat restoration efforts has emerged as an important means of healing previous human disturbance of river and stream environments. Restoration projects are seldom possible in big rivers, but restoration of small-stream habitats can often pay big dividends and help fulfill strategic land-health goals. Restoration projects completed in 2004 at the Saint Croix National Scenic Riverway, Wisconsin and Minnesota, and Golden Gate National Recreation Area, California, serve as good examples of how these efforts can benefit native fish. Both projects were undertaken with Natural Resource Program Center funding.

Brook trout (*Salvelinus fontinalis*) were once abundant in the upper Namekagon River and its cold-water tributaries. However, habitat destruction altered the aquatic community in favor of more warm-water-tolerant species. This led to concerns about potential extirpation of brook trout from the river system. To help protect river resources, Congress authorized the National Park Service to purchase land and scenic easements within a narrow corridor along two rivers. Once the land was acquired, the purpose of Saint Croix's restoration project was to restore a heavily disturbed area on Caps Creek—a tributary of the Namekagon River—as a means of protecting water quality and scenery while providing high-quality habitat for aquatic organisms, including native brook trout.

The National Park Service began the project in 1989 by removing buildings and restoring sites to more natural conditions. One of these sites is the Schultz Ponds, a former private trout hatchery where the hatchery's owners had diverted Caps Creek and excavated a number of shallow ponds with a connection to cold-water springs. Although the building had been removed, the remaining ponds dominated the view from the river, creating a visual distraction from the otherwise wild setting. In 2000 the Wisconsin Department of Natural Resources and the National Park Service agreed to restore the Schultz Ponds area by filling in the ponds and reconstructing a natural meandering channel for Caps Creek. A restoration plan was developed with oversight from the park. Once the channel was excavated and banks stabilized, suitable substrate and woody debris were placed in the creek to provide spawning areas and cover for trout and habitat for insects that trout use as food. For the next three years the Wisconsin Department of Natural Resources will resurvey fish in Caps Creek to determine project success. Early observations have already revealed several hundred brook trout overwintering at the junction of Caps Creek and the Namekagon River.



Two stream restoration projects in 2004 are good examples of how restoration efforts can benefit native fish species. Restoration of lower Easkoot Creek at Stinson Beach, California (aerial photo, left), improved riparian vegetation and rearing habitat for federally listed threatened steelhead and coho salmon (above). Restoration of Caps Creek (below) at Saint Croix National Scenic Riverway, Wisconsin and Minnesota, has led to the return of native brook trout.

Golden Gate National Recreation Area completed a stream habitat restoration project on lower Easkoot Creek at Stinson Beach in 2004. The primary goal of the project was to improve rearing habitat for federally threatened central California coast steelhead (*Oncorhynchus mykiss*) and coho salmon (*O. kisutch*) and to improve the area's native vegetation and floodplain. The creek ecosystem was rehabilitated by re-creating sinuosity, developing scour pools, increasing in-stream structure, and developing riparian vegetation and cover. Adjacent native riparian and wetland communities were also expanded to allow viable biological processes to occur, and all nonnative vegetation was removed. Local landowners, community organizations, and resource agencies were invited to participate in the planning and implementation of restoration actions.

Restoration projects completed in 2004 … serve as good examples of how these efforts can benefit native fish.

Post-project monitoring suggests that the effort is a success. Two large winter storms resulted in bank overflow and inundation of the adjacent floodplain for more than a week. Following these storms, channel alignment remained similar to the restored channel and meanders remained intact. Desirable scour holes have developed and gravel bars have been more naturally shaped. Future monitoring will help determine the overall increase in fish populations and survival of transplanted vegetation within the project area.

The Saint Croix National Scenic Riverway and Golden Gate National Recreation Area restoration projects are outstanding examples of what can and needs to be done at numerous parks throughout the National Park System. As the Park Service moves forward in achieving its land-health and restoration goals, these small-stream projects can serve as valuable learning experiences. ■

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A participatory approach to salt-marsh restoration in Jamaica Bay, New York

By George W. Frame and Doug Adamo

How does a highly urban park counter the loss of a salt marsh to erosion and rising sea level? In the case of Gateway National Recreation Area, the answer is to build up rather than out. The park includes New York City's Jamaica Bay estuary, where centuries of urban development reduced coastal wetlands to 10% of their pre-settlement extent. The remaining 1,000 acres (405 ha) of unfilled salt-marsh islands shrink by at least 40 acres (16 ha) each year. The city's hardened shorelines and filled coastal wetlands leave almost no place where the salt marshes can follow a natural course of moving farther inland as the sea level rises. The problem is compounded by contaminants from sewage, boat wakes, and other factors being studied.

Cooperative investigations with community groups, universities, and agencies in 2001–2003 identified possible courses of action to restore disappearing salt marshes. In September 2003 the park used a small swing-ladder dredge with a high-pressure nozzle to spray 6,800 cubic yards (5,202 m^3) of sand on top of 2 acres (0.8 ha) of Big Egg Marsh to raise its elevation by up to 20 inches (51 cm) and provide suitable soil for growth of 20,000 plugs of smooth cordgrass (*Spartina alterniflora*). Funding for the project came from National Park Service regional and national grants and from the State of New York.

A self-propelled swing-ladder dredge with a high-pressure spray nozzle applies a thin layer of sand to the marsh to raise its elevation. Building up the marsh counters the destructive effects of shoreline hardening, boat wakes, and urban contamination.

More than 130 volunteers, 30 park staff, and collaborators from universities and government agencies helped with preparation and maintenance of the restoration site and with monitoring physical and biological parameters. The ongoing monitoring activities conducted in 2004 contribute to a better understanding of salt-marsh processes in Jamaica Bay, provide useful information for future large restoration projects by the U.S. Army Corps of Engineers in Jamaica Bay, and increase public awareness and stakeholder involvement in conserving Gateway National Recreation Area's natural resources in the urban environment. ■

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Securing bat habitat in mines and caves at six national park areas

By John Burghardt

The National Park Service is working with partners to protect critical bat habitat in mines and caves in California, Nevada, and Arizona. The Cooperative Conservation Initiative (CCI) enabled the NPS Geologic Resources and Biological Resource Management Divisions, Bat Conservation International, the State of California, private industry, and other nonfederal and international entities to work together toward bat conservation. Matching federal and partner funds totaling $155,000 provided the means for projects at Death Valley and Joshua Tree National Parks, Whiskeytown and Lake Mead National Recreation Areas, Coronado National Memorial, and Organ Pipe Cactus National Monument.

During a bat gate fabrication workshop at Death Valley National Park, class participants and instructors installed a cupola over two sinkhole entrances to Devil's Hole. The cupola covers an 85-foot- (26-m-) deep upper cave chamber that hosts a maternity roost of Townsend's big-eared bats (*Corynorhinus townsendii*). This chamber connects to a partially flooded lower chamber that is home to endangered desert pupfish (*Cyprinodon diabolis*).

During a workshop on bat gate construction in Death Valley, for example, NPS and U.S. Fish and Wildlife Service employees joined staff from state programs, Bat Conservation International, Frontier Environmental Solutions, U.S. Borax, and Ecological Ventures California, Inc., who provided in-kind support in constructing a bat cupola over two sinkhole entrances to the Devil's Hole cave system. Cupolas cover vertical mine and cave openings, keeping humans out (and safe) while allowing bats to pass through. The park purchased steel for this sizable structure with CCI funds. Staff of U.S. Borax has conducted initial follow-up studies, which indicate that bats have already accepted the new closure at this site. In addition, park staff installed three shaft cupolas and five adit gates at three mine sites in Joshua Tree; the California Department of Conservation provided funding for mobilization and demobilization activities and the purchase of steel. Matching funds from a U.S. Borax–NPS partnership made possible the installation of an adit gate at Homestake Mine at Lake Mead. Managers at Whiskeytown have purchased supplies and hired temporary staff to construct nine bat gates at three mines in the national recreation area, to be completed in early 2005. To determine the best type of mine closure for endangered lesser long-nosed bats (*Leptonycteris curasoae*), NPS staff is joining partners from the Arizona–Sonoran Desert Museum and other state, private, and Mexican partners in trapping, cataloging, marking, and releasing the bats as they migrate among seven maternity and transient roost sites in mines and caves throughout southern Arizona and northern Sonora. Information gathered from this inventory will aid in evaluating bat gate alternatives for the Copper Mountain Mine at Organ Pipe Cactus and the State of Texas Mine at Coronado. ■

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NPS**FACT**

In 2004 the National Park Service revised its five-year goal under the Government Performance and Results Act (GPRA goal Ia1A) **to restore 5%** (21,850 acres or 8,840 ha) **of the total 437,150 acres** (177,046 ha) of park lands disturbed by development or agriculture by 2008.* It exceeded the first-year (FY 2004) target of 4,700 acres (1,904 ha) by restoring 6,600 acres (2,673 ha) of those lands. **The total number of acres restored** since annual goals were first adopted under GPRA in 2000 **is 20,125 (8,151 ha) over four years.**

**The goal is specific to park lands disturbed by development or agriculture and does not address restoration of fauna, control of invasive plants, and use of fire as a restoration tool. Causes of disturbance include facilities, roads, mines, dams, abandoned campgrounds, farming, grazing, timber harvest, and abandoned irrigation ditches. The goal is updated every three years to account for progress and changes in the total area being targeted for restoration.*

Restoring the endangered Miami blue butterfly in south Florida national parks

By Sue Perry

THE MIAMI BLUE BUTTERFLY, *Cyclargus thomasi bethunebakeri*, was once common in habitats in coastal areas of south Florida and the Keys, including Everglades, Biscayne, and Dry Tortugas National Parks. It declined rapidly over the last several decades and was feared extinct until 1999, when a small population was discovered in a state park. The reasons for the steep decline are unknown, but rapid urban development and the resulting loss of habitat, as well as widespread mosquito spraying and the replacement of its host plants by exotic vegetation, are known to be important factors. In 2002 the Florida Fish and Wildlife Conservation Commission issued an emergency endangered species protection order, and then listed the Miami blue as an endangered species in November 2003. Researchers estimated that no more than about 50 individuals occurred in the only remaining population. No other populations were discovered in south Florida, making the Miami blue one of the most endangered animal species in the world.

Government agencies, conservation organizations, and biologists have worked together in an intensive conservation effort. In February 2003, researchers from the McGuire Center for Lepidoptera Research at the University of Florida collected eggs and began a captive breeding program. The goal is to distribute individuals from the captive colony to protected lands to try to establish new breeding populations. The Miami blue working group made the decision to begin the restoration program in Everglades and Biscayne National Parks in late May 2004. Researchers are releasing caterpillars and adult butterflies monthly at sites that cover a wide geographic area, in hopes of avoiding the species' extirpation by a hurricane in any one area. Specific locations will not be revealed to the public initially, to protect the butterflies from collectors, but the general restoration effort will be featured in interpretive programs.

The Miami blue is currently reproducing and doing well in the parks, but it is too soon to know if the reintroduction will ultimately be successful.

The reintroduced butterflies have already had to adapt to a severe drought in June and hurricane winds and storm surge in August and September. The Miami blue is currently reproducing and doing well in the parks, but it is too soon to know if the reintroduction will ultimately be successful. Researchers at the University of Florida are seeking answers to a number of questions that may affect its survival, such as the relationship of the Miami blue to ants that protect the caterpillars from predators in exchange for a sweet secretion.

The Miami blue is only one of a suite of south Florida butterflies that have become very rare. Many butterfly species have been extirpated in the national parks. One species that was planned for reintroduction appears to have recently become extinct. A number of subtropical butterfly species can be seen only in the southernmost areas of the United States. Some butterflies migrate south from northern areas to spend the winter in Florida's national parks.

The Miami blue butterfly (female, top; male, bottom) is one of the most endangered animal species in the world. Agency and university scientists are working together in a cooperative conservation effort to restore the species in south Florida. Releases of caterpillars and adults in Everglades and Biscayne National Parks began in 2004.

As butterfly watching becomes increasingly popular, the south Florida parks are putting more emphasis on invertebrate conservation. A major cooperative effort among all the divisions within each park will attempt to protect both the endangered butterflies and endangered ecosystems. Planning includes possible changes in prescribed fire plans to include consideration of the many smaller organisms, like butterflies, that cannot disperse far. Changes in the maintenance plan will result in less mowing in natural areas with native plants that provide food for caterpillars and butterflies. If successful, these changes may result in the Miami blue's becoming one of the species that draws visitors to the parks. ■

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